

EXAMPLE 1. HYPOTHETICAL PETROLEUM REFINERY SCENARIO

FACILITY: PETROLEUM REFINERY

- Major (Listed) Source – Existing facility allowable emissions > 100 tpy for criteria pollutants NO_x, SO₂, and CO

SOLUTION SHEET

PROPOSED PROJECT:

*A petroleum refinery would like to add a **90 MMBTU/hr** natural gas boiler with low NO_x burner to their facility.*

TOOLS:

Emissions Factors (EF) from AP-42, Section 1.4:

Pollutant	Emissions Factor (lb/MMSCF NG)*
PM ₁₀	7.6
SO ₂	0.6
Pb	0.0005
NO _x	100
VOC	5.5
CO	8.4
CO ₂	120000
CH ₄	2.3
N ₂ O	0.64

* 1 MMSCF NG = 1020 MMBtu

PROBLEM SOLVING:

Question 1: What would the increase in emissions be for the proposed project?

Example Calculation:

PM₁₀ Emissions [tons/yr] =

$(90 \text{ MMBtu/hr}) * (1 \text{ MMSCF}/1020 \text{ MMBtu}) * (7.6 \text{ lb/MMSCF}) * (8760 \text{ hr/yr}) * (1 \text{ ton}/2000 \text{ lb}) = \mathbf{3 \text{ tons/yr}}$

Calculate CO₂ Emissions [tons/yr] =

$(90 \text{ MMBtu/hr}) * (1 \text{ MMSCF}/1020 \text{ MMBtu}) * (120,000 \text{ lb/MMSCF}) * (8760 \text{ hr/yr}) * (1 \text{ ton}/2000 \text{ lb}) = \mathbf{46,376 \text{ tons/yr}}$

Calculated Total Emissions from 90 MMBtu/hr NG Boiler (Tons/Year):								
PM ₁₀	SO ₂	Pb	NO _x	VOC	CO	CO ₂	CH ₄	N ₂ O
3	0	0	39	2	32	46,376	0.9	0.2

Question 2: On a mass basis, what are the total emissions of GHGs?

CO₂+CH₄+N₂O = Total Emissions of GHG's (MASS)

46,376 tons + 0.9 tons + 0.2 tons = **46,377 tons/year**

Question 3: What are the total emissions of CO_{2e}?

Step 1: Refer to Global Warming Potential (GWP) Table (Title 40, Part 98, Subpart A, Table A-1)

Step 2: Identify pollutants and their respective GWPs.

Pollutant	Global Warming Potential
CO ₂	1
CH ₄	21
N ₂ O	310

$$CO_{2e}(tpy) = \sum (GWP_i \times MassEmissionRate_i(tpy))$$

$$CO_{2e}(tpy) = (46,376 \times 1) + (0.9 \times 21) + (0.2 \times 310) = \mathbf{46,457 \text{ tons/yr}}$$

Question 4: So, we have

GHGs(mass)	CO _{2e}
46,377 tons/yr	46,457 tons/yr

APPLICABILITY ANALYSIS (PSD):

Question 1: Does the permit action result in a net increase of any criteria pollutant that exceeds a PSD SER level?

No, net emissions changes of criteria pollutants are all less than the PSD SER levels

Question 2: Does the permit action have CO_{2e} emissions in excess of PSD threshold?

No, permit action has a net CO_{2e} increase of 46,457 TPY which is less than the 75,000 TPY SER

Question 3: Does the permit action have GHG emissions in excess of PSD threshold (mass basis)?

Yes, the permit action has a net GHG emission increase of 46,377 TPY which is greater than the 0 TPY SER

If the answer is YES to BOTH Questions #2 & #3, then greenhouse gas must undergo PSD review based on the following:

- **permit decision occurs before 1/2/11:** greenhouse gas need not be considered for PSD review
- **permit decision occurs between 1/2/11 and 7/1/11:** greenhouse gas must undergo PSD review only if there are any criteria pollutants that must undergo PSD review
- **permit decision occurs on or after 7/1/11:** greenhouse gas must undergo PSD review along with any criteria pollutants that exceed their PSD SER

APPLICABILITY ANALYSIS (Title V):

TV permit decision occurs before 1/2/11: greenhouse gas need not be addressed in TV permit

TV permit decision occurs after 1/2/11: greenhouse gas must be addressed in TV permit
("anyway" source)

TV permit decision occurs after 7/1/11: greenhouse gas must be addressed in TV permit